

AMMONIUM NITRATE

CAS Registry Number: 6484-52-2

NH_4NO_3

Molecular Formula: $\text{H}_4\text{N}_2\text{O}_3$

Ammonium nitrate is an odorless, transparent, hygroscopic substance. It can appear as deliquescent crystals or white granules. Five solid phases exist at normal pressure and the crystals are orthorhombic at room temperature (Merck, 1989). Ammonium nitrate changes its crystal form every time it passes through a temperature of at least 90 °F (HSDB, 1993). It also absorbs moisture rapidly from the air when the humidity exceeds about 60 percent. Ammonium nitrate is soluble in water, alcohol, acetone, ammonia, ether, and alkalies (Sax, 1987). Decomposition occurs at 210 °C with the production of water and nitrous oxide (Merck, 1989). When heated to decomposition, it emits highly toxic fumes of oxides of nitrogen (Sax, 1989).

Physical Properties of Ammonium Nitrate

Synonyms: nitric acid; ammonium salt; ammonium (I) nitrate (1:1); Norway saltpeter; Varioform I; Merco Prills; Nitram; nitrate of ammonia; German saltpeter

Molecular Weight:	80.06
Boiling Point:	210 °C at 11 mm Hg
Melting Point:	169.6 °C
Density/Specific Gravity:	1.725 at 25 °C

(HSDB, 1993; Merck, 1989; Sax, 1989)

SOURCES AND EMISSIONS

A. Sources

Ammonium nitrate is used in the manufacture of fertilizers, matches, and pyrotechnics, herbicides, and insecticides. Ammonium nitrate is also found in hair dyes, tints, and colorings (HSDB, 1993). It is also used as a chemical intermediate for nitrous oxide (laughing gas). It is an absorbent for nitrogen oxides, an ingredient of freezing mixtures, an oxidizer in solid rocket propellants, a nutrient for antibiotics and yeast, a component of mixtures with fuel oil for explosives, and a catalyst (Sax, 1987). The primary sources that have reported emissions of ammonium nitrate in California are concrete, gypsum and plaster products, and crushed and broken stone mining (ARB, 1997b).

B. Emissions

The total emissions of ammonium nitrate from stationary sources in California are estimated to be at least 1,000 pounds per year, based on data reported under the Air Toxics “Hot Spots” Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

No information regarding the natural occurrence of ammonium nitrate was found in the readily-available literature (HSDB, 1993).

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient concentrations of ammonium nitrate.

INDOOR SOURCES AND CONCENTRATIONS

A potential source of indoor ammonium nitrate is through the reaction of ammonia (mostly from indoor sources) with nitric acid (Suh et al., 1994). Several studies measured nitrate levels inside residences located in the eastern United States (in California, sulfuric acid rather than nitric acid, predominates outdoors) and found indoor levels either somewhat higher than outdoor levels (Suh et al., 1994) or somewhat lower than outdoor levels (Brauer et al., 1991). An unknown fraction of the nitrate is likely to be in the form of ammonium nitrate.

ATMOSPHERIC PERSISTENCE

In the atmosphere, ammonium nitrate is particle-associated and hence subject to wet and dry deposition. The average half-life for particles and particle-associated chemicals in the troposphere is estimated to be approximately 3.5 to 10 days (Balkanski, et. al., 1993). Particle-phase ammonium nitrate is in equilibrium with gaseous ammonia and gaseous nitric acid at standard atmospheric temperature and pressure. With increasing temperature, this equilibrium favors gas-phase ammonia plus nitric acid (Atkinson, 1995).

AB 2588 RISK ASSESSMENT INFORMATION

Although ammonium nitrate is reported as being emitted in California from stationary sources, no health values (cancer or non-cancer) are listed in the California Air Pollution Control Officers Association Air Toxics “Hot Spots” Program Revised 1992 Risk Assessment Guidelines for use in risk assessments (CAPCOA, 1993).

HEALTH EFFECTS

Probable routes of human exposure are inhalation, ingestion, and dermal contact.

Non-Cancer: Exposure to ammonium nitrate can cause eye and skin irritation and burns. Inhalation exposure can result in irritation of the nose, throat and lungs. Extreme exposure can result in nausea, vomiting, flushing of the face and neck, headache, faintness and collapse (New Jersey Hazardous Substance Fact Sheet, 1995). In addition, severe exposures may induce methemoglobinemia and reduce the oxygen carrying capacity of the blood (U.S. EPA, 1995a).

Cancer: Ammonium nitrate has not been evaluated for carcinogenic potential by the United States Environmental Protection Agency or the International Agency for Research on Cancer (U.S. EPA, 1995a).

